

Cal Poly Views
Earthquakes with
Dr. Lawrence J. Herbert

Cal Poly Pomona University Library

Earthquakes Summary

Cal Poly Views was a weekly interview series broadcast on radio station KWOW-AM. Episodes were 15 minutes long and were hosted by Cal Poly Pomona Director of News and Publications, Ed Pierce, in conversation with Cal Poly Pomona faculty or administrators on general interest topics.

Dr. Lawrence Herbert was a professor of geological sciences at Cal Poly Pomona. Dr. Herbert explains what earthquakes are, how they detected and measured, and discusses seismic activity in Southern California.

Subject Headings

Earthquakes

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Cal Poly Views Earthquakes with Dr. Lawrence J. Herbert

October 23, 1985

*Interview Conducted by Ed Pierce
Transcribed by Lorecel Gravino*

EP: KWOW presents *Cal Poly Views*.

EP: Hello everyone, welcome to KWOW's presentation of *Cal Poly Views*. Fifteen minutes each week devoted to interviews concerning subjects of current general interest and featuring faculty or administrators from Cal Poly Pomona. This is your host Ed Pierce, talking today with Dr. Lawrence Herbert, professor of Geological Sciences at Cal Poly. And together we will be discussing an interesting and perhaps pertinent point, earthquakes. Dr. Herbert has been a faculty member since 1966 at Cal Poly Pomona. He's a registered geologist in the state of California, author of scientific articles and papers for journals and meetings on earthquake faults, in Southern California and participant in the Geological Sciences Department long-term research project on the Cucamonga fault. He's a consultant and authority on many of the local earthquake faults in Southern California. Welcome, Dr. Herbert.

LJH: Thank you, Mr. Pierce.

EP: Where do we begin? Let's maybe begin by my asking you to describe, are there earthquakes that we don't know anything about? And then I mean by that not because they're on the other side of the world, but are they so deep in the surface that we don't know?

LJH: Most earthquakes that are of any size at all, we can pick up on seismographs. There would be some very, very, small earthquakes that wouldn't give us a record on a seismograph and they wouldn't give us a record on the surface, and they wouldn't cause any damage either.

EP: Kind of like a tree falling and nobody can hear it, the age-old scientific question, was there noise or not?

LJH: Something like that, except that would be very small tree in this case, if we could pick it up.

EP: How many major faults, earthquake faults are there in Southern California, say within 50 miles of Cal Poly Pomona?

LJH: We have about a half dozen of them. If we start over in the east and the San Bernardino area, we have the San Andreas fault, the major fault, and then the San Jacinto fault. and in the foothills of the mountains, we have the Santa Monica, Raymond Hill, and Cucamonga faults. The Cucamonga fault is more in our territory here. Then we have the Elsinore-Whittier fault and

the Newport-Inglewood fault. Of those, the ones that seem to be the most active are the San Andreas fault, the San Jacinto fault, and the Newport-Inglewood fault.

EP: And what was the one that you mentioned over near the coast to Santa Monica?

LJH: The Santa Monica fault, the Malibu coast Santa Monica.

EP: Is the San Andreas perhaps the best known because it's the longest?

LJH: It's the best known because it's the longest and it's also the best known because it's the most active one in California.

EP: And all of these have the potential, scientifically, to be hazardous.

LJH: Yes, each one of these is potentially hazardous. The San Jacinto, the San Andreas, and the Newport-Inglewood, perhaps more than the others I mentioned, because they have a history of more frequent activity in recent time.

EP: How frequent or infrequent is measurable activity on most or all, of these faults?

LJH: Measurable activity in terms of the faults moving today, is occurring on the San Andreas, it's creeping in places at the rate of several centimeters per year. The San Jacinto fault is very active, it's also creeping and creeping although in many cases it's not causing any earthquakes. The Newport-Inglewood fault is perhaps best known for the 1933 Long Beach earthquake, but it does not seem to be creeping on the surface.

EP: So, geologically, in geological time, they're very active.

LJH: In geologic time they're very active and even in the present day, like in the last 20 years and today creep is actually taking place, movement is actually taking place on the San Andreas and the San Jacinto fault.

EP: Am I right that sometimes, the rather frequent or constant creeping kind of movement, reduces the potential for hazard rather than one that seems to be locked and then shifts all of a sudden, in a major one?

LJH: That seems to be the case and in many, for many faults at least during this stage when they are creeping rather slowly, the strain energy doesn't build up and so there are no large earthquakes.

EP: Can you define for me and other laymen, what an earthquake is?

LJH: Earthquake is really the sudden vibration of the ground or any surface you're standing on, due to rupture of rock. So, if you take a plank for example and put one end up higher than the other and jump on it and break it, when that breaks that would give out something like an earthquake. And it may give out sound waves which are very much like earthquake waves in the case of the plank, you would hear them. In the case of the earthquake, ground earthquake, you would feel them if they're large enough.

EP: You told me earlier and I find it difficult to not believe but to understand, that a quake of significant magnitude, let's use an example of the recent Mexico City quake.

LJH: Yeah.

EP: That could be picked up on seismographic instrumentation all around the world.

LJH: Yes, that one was large enough that it would.

EP: So, does this transmit itself through the earth crust all that distance, or does something?

LJH: yes, it transmits itself through the earth's crust by the mode of seismic waves which are very much like sound waves going through the atmosphere. So, you can hear for example a dynamite blast if it's large enough for miles, tens of miles and perhaps even hundreds of miles. Or meteorite impact might be heard for thousands of miles as it propagates through the atmosphere. And large earthquakes, propagated through the rock, can be felt throughout the entire earth.

EP: What are some of the determinants that would establish damage in a large earthquake?

LJH: Some of the factors that might cause damage in a large earthquake, the earthquake itself would be large enough to cause severe shaking that would cause damage to maybe weak buildings. Other factors would include the geology on the soils, conditions, in the area. For example, Mexico City, the part that was the worst damaged, was built on an old lakebed. The parts of it that are built on rock weren't damaged nearly as badly. And then a third feature of the damage, would be the type of construction and the detailing in the construction, inspection of the construction, generally just the quality of construction. We like to think that at least up here, that our codes and ordinances are such that construction is better than maybe it is in some other countries. It seems like that may have been the case for at least part of the destruction in Mexico City.

EP: We—at the time of an earthquake here that it measured 6.2 or 3.4 whatever on the Richter scale. Most people I think, in Southern California identify Charles Richter, who recently passed away, from Caltech as the father of that measurement. As it's not something he measured with his grandfather's watch though. I'm leading to—have you describe something about seismograph. How does it work? How long as it existed?

LJH: Seismographs have existed for well over 100 years, some of the early varieties were very crude. The Richter scale came into existence in the middle to late [19]30s, as you mentioned, by Charles Richter. His scale is primarily a measurement of the energy given off by earthquake waves. The earthquake waves affect the seismograph or affect his instrument much like shaking of an open gate would affect the gate. One end of the gate is stationary, the other end of the gate is free. So, if we tend to hit the stationary end of the gate, the gate would open or vibrate in one direction or the other and that's about what happens on a seismograph.

EP: And these are recorded by very sensitive moving arms or needles that trace on paper?

LJH: That's right. They're recorded either mechanically with pens, actual pens and traced on paper that's plastered around a revolving drum, or they might record photographically on photographic paper which is also moving on a drum.

EP: I see. Is there any electronic seismograph yet or anticipated to be?

LJH: There are electronic seismographs also and they—the main feature of all of these is so that they do have to be jarred by some sort of an earthquake.

EP: And we hear that an earthquake occurred, oh, 15 miles or 9 miles south and east of San Bernardino to cite another recent example. How do they establish that pinpoint, a location?

LJH: The best way and the most accurate way to pinpoint the location of the earthquake is to have three seismometers, setting at about the corners of an equilateral triangle around the epicenter. Of course, these seismometers then would have to be in place already before the earthquake occurs. Usually that's not the case, but usually in most places in the U.S. we do have three seismometers and all three of these then are required to locate the quake by method of triangulation.

EP: And there is a time lag perhaps, very small in some cases but they know how far away it was by, this occurred at 3:15 point 23, how?

LJH: Yes. When the earthquake occurs and the waves were sent out the seismograph picks this up and causes little squiggles on the paper and there are two main waves that are used, the one wave comes, one wave travels faster, another wave travels more slowly and the difference between the time of arrival of these two waves can be translated into distances. And so what they commonly do is draw like a circle using the seismometer station itself as the center and if you draw three circles you end up with those three intersecting one point and that would be the epicenter, the location of it.

EP: If I use the word repeat or recurrence interval, that's the way that predictions are made, regarding future quakes, quakes in the future?

LJH: It's probably the best way to determine when a quake will occur in the future. For example, in the Parkfield, California case, there have been about six earthquakes that have occurred since the late 1800s and these are known from newspaper observations and also recently from actual recordings on seismographs in that they occur on an average about every 20, 22 years. And the last one occurred in the mid-60s and so they figure the next one now is going to occur in the mid-80s. And they're expecting it to occur around 1987, 1988 plus or minus a year or two. So that's how they establish a repeat, or the recurrent interval and that's a very good method for trying to predict earthquakes.

EP: Describe the CALEEP program if you will, C-A-L-E-E-P.

LJH: A CALEEP program is the California Earthquake Education Project, and as I understand it, it was just very recently funded by the state legislature. And the thrust of the program is to provide information for all sorts of schoolchildren whether they're in the lower grades or the upper grades and for the interested people too, to get information on earthquakes to reduce the loss of life and property in the event of a major earthquake. We might mention that the major earthquake that is postulated for Southern California is about an 8.3 on the Richter scale and will be along the San Andreas fault and it will probably move for 100 miles or so starting at a point, just north and northwest of San Bernardino.

EP: And that is established against on this recurrence pattern?

LJH: That's established primarily on the basis of recurrence interval, except in this case they trenched the San Andreas fault in these areas and determined from radio metric dating what the recurrence interval would be going back about 1500 years.

EP: And when is that expected?

LJH: The exact date isn't known, but the percentages given are this, there's a better than 50% chance in the next 30 years. Some people say 50 to 90% chance in the next 30 years, but most people are saying 50% chance, better than 50% within the next 30 years, along this section of the San Andreas fault.

EP: Well thank you, Dr. Herbert, and thank you ladies and gentlemen for listening to this week's edition of Cal Poly views. Fifteen minutes devoted to discussing topics of current and general interest. If there are subjects which you would like to hear discussed by faculty or administrative experts from Cal Poly Pomona, please write to *Cal Poly Views*, Office of News and Publications, 3801 W. Temple Ave., Pomona 91768. We hope you'll join us again next week at the same time for another interesting interview when KWOW presents *Cal Poly Views*. This is your host, Ed Pierce, speaking.

End of interview

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